REMARKS

This application has been carefully reviewed in light of the Office Action dated July 16, 2002 (Paper No. 12), and the Advisory Action dated December 16, 2002 (Paper No. 14). Claims 1 to 29, 32 to 60 and 63 to 91 are currently in the application, with Claims 1, 32 and 63 being the independent claims. Reconsideration and further examination are respectfully requested.

Procedurally, this Second Amendment After Final Rejection re-presents the claim amendments made in the Amendment After Final Rejection dated November 18, 2002, in view of the Advisory Action that indicated that the Amendment After Final Rejection would not be entered. In addition, further changes to independent Claims 1, 32 and 63 have also been made in this Second Amendment After Final Rejection.

Applicants again thank the Examiner for the indication that Claims 4 to 29, 35 to 60 and 66 to 91 contain allowable subject matter and would be allowable if rewritten in independent form. Applicants have not rewritten these claims in independent form, however, since all of the claims currently in the application are believed to be allowable, as discussed in more detail below.

Claims 1 to 3, 32 to 34 and 63 to 65 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 6,268,871 (Rice). Applicants have carefully reviewed the Examiner's comments together with the applied reference and respectfully submit that the claims herein are patentably distinguishable over the applied reference for at least the following reasons.

The present invention concerns the orientation of a space curve that has one of two different directions, either a forward direction proceeding along the space curve

from an initial endpoint to a terminating endpoint or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint. The direction the space curve is to be oriented to is determined by comparing a generated first vector, which has a selected desired direction, and a generated second vector, which has a direction representative of and derived from a corresponding characteristic of the space curve. The determined direction is the one direction of either the forward or the reverse direction of the space curve that is closest to the selected desired direction.

With reference to particular claim language, independent Claims 1, 32 and 63 concern orientating a space curve, where the space curve has two endpoints and is adapted to have one of two directions, either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint, or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint. A desired direction is selected and a first vector having a direction which is the same as the selected desired direction is generated. At least one second vector is generated, where each second vector has a corresponding direction representative of and derived from a corresponding characteristic of the space curve. The first and second vectors are compared so as to determine a direction of the space curve, where the determined direction of the space curve is one of two directions, either the forward direction or the reverse direction, that is closest in direction to the selected desired direction. The direction of the space curve is then orientated in accordance with the determined direction.

The applied reference is not understood to disclose or suggest the foregoing features of the present invention. In particular, the applied reference is not understood to disclose or suggest at least the features of generating a second vector having a

corresponding direction representative of and derived from a corresponding characteristic of the space curve, comparing a first vector, having a selected desired direction, with the second vector to determine which of either a forward direction or a reverse direction of the space curve is closest to the selected desired direction, and orientating the direction of the space curve to the determined direction.

Rice concerns a method for generating a blended curve using constraint points, where each constraint point has specified geometric continuity conditions the blended curve must satisfy at that point. Initially, Applicants submit that Rice is not understood to disclose generating a second vector having a direction representative of and derived from a corresponding characteristic of the space curve. The Office Action contends that the description in Rice beginning at column 4, line 21, teaches generating a second vector. Applicants respectfully disagree with this interpretation and submit that this portion of Rice is understood to describe the setting of continuity conditions for each of the constraint points used to create the blended curve. While the continuity conditions may include a direction vector, such as direction vector 30a depicted in Figure 4 of Rice, the Office Action has contended that the direction vector corresponds with the first vector generated according to the invention and not the second vector. Furthermore, the process taught in Rice differs fundamentally from that of the present invention since the direction vector in Rice is used to generate a blended curve, while in the present invention the second vector is generated from characteristics of an existing space curve. Therefore, Applicants respectfully submit that Rice is not understood to disclose or suggest the feature of generating a second vector having a corresponding direction representative of and derived from a corresponding characteristic of the space curve.

The Office Action further contends that Figures 6 and 10 of Rice depict the blended curve having a forward direction or a reverse direction, where the forward direction proceeds along the blended curve from an initial endpoint to a terminating endpoint and the reverse direction proceeds along the blended curve from the terminating endpoint to the initial endpoint. Applicants respectfully submit that Rice is not understood to teach the blended curve as having either a forward direction or a reverse direction. The Office Action appears to imply that the direction vectors 30a, 30b and 30c, as shown in Figures 6 and 10 of Rice, depict the direction of the blended curve. Even if this were correct, which Applicants do not concede, it is unclear in Figures 6 and 10 which direction the blended curve actually has since direction vector 30a appears to be in the opposite direction of direction vectors 30b and 30c. Accordingly, Applicants maintain that Rice is not understood to teach that the blended curve has a particular direction, and specifically is not understood to teach that the blended curve has one of either a forward or a reverse direction.

Finally, the Office Action contends that it would have been obvious to one skilled in the art to compare first and second vectors to determine a direction of the curve in Rice based on the description beginning at column 4, line 21, of Rice. Applicants maintain that this portion of Rice is understood to simply disclose setting continuity conditions at constraint points such that a blended curve created using the constraint points is joined to and co-located with appropriate underlying geometry. This portion of Rice is not understood, however, to suggest that first and second vectors be compared to determine a direction of the curve given that Rice is not understood to disclose generating a second

vector, as discussed above. In addition, since the described continuity points are used in Rice to generate a blended curve, Applicants submit that Rice is not understood to have an existing curve for which a direction can be determined. Therefore, Applicants respectfully submit that Rice is not understood to contain any disclosure or suggestion to compare first and second vectors to determine the direction of a curve.

For the foregoing reasons, Rice is not understood to disclose or suggest at least the features of generating a second vector having a corresponding direction representative of and derived from a corresponding characteristic of the space curve, comparing a first vector, having a selected desired direction, with the second vector to determine which of either a forward direction or a reverse direction of the space curve is closest to the selected desired direction, and orientating the direction of the space curve to the determined direction. Accordingly, independent Claims 1, 32 and 63 are believed to be allowable over the applied reference. Reconsideration and withdrawal of the § 103(a) rejection of Claims 1, 32 and 63 are respectfully requested.

The other claims in the application are dependent from the independent claims discussed above and are believed to be allowable over the applied reference for at least the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, however, the individual consideration of each on its own merits is respectfully requested.

In view of the foregoing amendment and remarks, the entire application is believed to be in condition for allowance and such action is respectfully requested at the Examiner's earliest convenience.

Applicants' undersigned attorney may be reached in our Costa Mesa, California, office by telephone at (714) 540-8700. All correspondence should be directed to our address given below.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE TO CLAIMS

1. (Twice Amended) A method of orientating a space curve, wherein the space curve has two endpoints and is adapted to have one of two directions, either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint, the method comprising the steps of:

selecting a desired direction;

generating a first vector having a direction which is the same as the selected desired direction;

generating at least one second vector, each second vector having a corresponding direction [indicative of] representative of and derived from a corresponding characteristic of the space curve;

comparing the first and second vectors so as to determine a direction of the space curve, wherein [the space curve has one of two directions, either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint, and wherein] the determined direction of the space curve is [a direction along the space curve from a first endpoint to a second endpoint] one of two directions, either the forward or the reverse direction, that is closest in direction to the selected desired direction; and

orientating the direction of the space curve [in accordance with] to the determined direction.

4. (Twice Amended) A method as claimed in claim 3, wherein said step of comparing [step] the first and second vectors comprises the sub-steps of:

determining a first angle between one of the second vectors and the first vector;

determining a second angle between the other one of the second vectors and the first vector; and

comparing the first angle with the second angle,

wherein if the first angle is less than the second angle then the determined direction of the space curve is in a first direction, and if the first angle is greater than the second angle then the determined direction of the space curve is in a second direction, opposite the first direction.

5. (Twice Amended) A method as claimed in claim 2, wherein said step of comparing [step] the first and second vectors comprises the sub-steps of:

determining a first angle between the first vector and the second vector; and

comparing the first angle with a first threshold value,

wherein if the first angle is less than the first threshold value then the determined direction of the space curve is in a first direction, and if the first angle is greater than the first threshold value then the determined direction of the space curve is in a second direction, opposite the first direction.

11. (Twice Amended) A method as claimed in claim 7, wherein, if the first angle equals the second angle, said step of comparing [step] the first and second vectors further comprises the sub-steps of:

determining a third angle between one of the second vectors and the orthogonal vector;

determining a fourth angle between the other one of the second vectors and the orthogonal vector; and

comparing the third angle with the fourth angle,

wherein if the third angle is less than the fourth angle then the determined direction of the space curve is in a third direction, and if the third angle is greater than the fourth angle then the determined direction of the space curve is in a fourth direction, opposite the third direction.

12. (Twice Amended) A method as claimed in claim 8, wherein if the first angle equals the first threshold value, said step of comparing [step] the first and second vectors further comprises the sub-steps of:

determining a second angle between the second vector and the orthogonal vector; and

comparing the second angle with a second threshold value,

wherein if the second angle is less than the second threshold value then the determined direction of the space curve is in a third direction, and if the second angle is greater than the second threshold value then the determined direction of the space curve is in a fourth direction, opposite the third direction.

14. (Twice Amended) A method as claimed in claim 1, wherein said step of generating at least one second vector comprises the substeps of:

determining endpoints of the space curve; and

generating, at each endpoint, a second vector tangent to the space curve.

15. (Twice Amended) A method as claimed in claim 14, wherein said step of comparing [step] the first and second vectors comprises the sub-steps of:

determining a first angle between one of the second vectors and the first vector;

determining a second angle between the other one of the second vectors and the first vector; and

comparing the first angle with the second angle,

wherein if the first angle is less than the second angle then the determined direction of the space curve is in a first direction, and if the first angle is greater than the second angle then the determined direction of the space curve is in a second direction, opposite the first direction.

18. (Twice Amended) A method as claimed in claim 17, wherein said step of comparing [step] the first and second vectors further comprises the sub-steps of:

determining a third angle between one of the third vectors and the first vector;

determining a fourth angle between the other one of the third vectors and the first vector; and

comparing the third angle with the fourth angle,

wherein if the third angle is less than the fourth angle then the determined direction of the space curve is in a third direction, and if the third angle is greater than the fourth angle then the determined direction of the space curve is in a fourth direction, opposite the third direction.

19. (Twice Amended) A method as claimed in claim 16, wherein said step of comparing [step] the first and second vectors comprises the sub-steps of:

determining a third angle between the third vector and the first vector; and

comparing the third angle with a first threshold value,

wherein if the third angle is less than the first threshold value then the determined direction of the space curve is in a third direction, and if the third angle is greater than the first threshold value then the determined direction of the space curve is in a fourth direction, opposite the third direction.

25. (Twice Amended) A method as claimed in claim 21, wherein if the third angle equals the fourth angle, said step of comparing [step] the first and second vectors further comprises the sub-steps of:

determining a fifth angle between the first one of the third vectors and the orthogonal vector;

determining a sixth angle between the other one of the third vectors and the orthogonal vector; and

comparing the fifth angle with the sixth angle,

wherein if the fifth angle is less than the sixth angle then the determined direction of the space curve is in a fifth direction, and if the fifth angle is greater than the sixth angle then the determined direction of the space curve is in a sixth direction, opposite the fifth direction.

26. (Twice Amended) A method as claimed in claim 22, wherein if the third angle equals the first threshold value, said step of comparing [step] the first and second vectors comprises the sub-steps of:

determining a fourth angle between the third vector and the orthogonal vector; and

comparing the fourth angle with a second threshold value,

wherein if the fourth angle is less than the second threshold value then the determined direction of the space curve is in a fourth direction, and if the fourth angle is greater than the second threshold value then the determined direction of the space curve is in a fifth direction, opposite the fourth direction.

28. (Twice Amended) A method as claimed in claim 1, wherein the method comprises the step of providing further space curves and performing said step of generating at least one second vector, said step of comparing the first and second vectors, and said [comparing] step of orientating the direction of the space curve on each space curve.

32. (Three Times Amended) An apparatus for orientating a space curve, wherein the space curve has two endpoints and is adapted to have one of two directions,

either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint, the apparatus comprising:

selection means for selecting a desired direction;

first generation means for generating a first vector having a direction which is the same as the selected desired direction;

means for providing the space curve;

second generation means for generating at least one second vector, each second vector having a corresponding direction [indicative of] representative of and derived from a corresponding characteristic of the space curve;

[comparing] first comparison means for comparing the first and second vectors so as to determine a direction of the space curve, wherein [the space curve has one of two directions, either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint, and wherein] the determined direction of the space curve is [a direction along the space curve from a first endpoint to a second endpoint] one of two directions, either the forward or the reverse direction, that is closest in direction to the selected desired direction; and

orientation means for orientating the direction of the space curve [in accordance with] to the determined direction.

57. (Twice Amended) An apparatus as claimed in claim 53, wherein the first comparison means further comprises [the following]:

means for determining a fourth angle between the third vector and the orthogonal vector; and

means for comparing the fourth angle with a second threshold value,

wherein if the fourth angle is less than the second threshold value then the determined direction of the space curve is in a fourth direction, and if the fourth angle is greater than the second threshold value then the determined direction of the space curve is in a fifth direction, opposite the fourth direction.

63. (Three Times Amended) A computer program product comprising a computer readable medium having a computer program for orientating a space curve, wherein the space curve has two endpoints and is adapted to have one of two directions, either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint or a reverse directions proceeding along the space curve from the terminating endpoint to the initial endpoint, the computer program product comprising:

selection means for selecting a desired direction;

first generation means for generating a first vector having a direction which is the same as the selected desired direction;

means for providing [a] the space curve;

second generation means for generating at least one second vector, each second vector having a corresponding direction [indicative of] representative of and derived from a corresponding characteristic of the space curve;

first comparison means for comparing the first and second vectors so as to determine a direction of the space curve, wherein [the space curve has one of two

directions, either a forward direction proceeding along the space curve from an initial endpoint to a terminating endpoint or a reverse direction proceeding along the space curve from the terminating endpoint to the initial endpoint, and wherein] the determined direction of the space curve is [a direction along the space curve from a first endpoint to a second endpoint] one of two directions, either the forward or the reverse direction, that is closest in direction to the selected desired direction; and

orientation means for orientating the direction of the space curve [in accordance with] to the determined direction.

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